Note on the Development of Lost Parts in the *Nemerteans*.

By W. C. M'Intosh, M.D., F.L.S.

(Plate VII.)

[Read June 18, 1868.]

The investigator of the Annelids is familiar enough with instances of the reproduction of lost parts throughout the entire series, and it is almost unnecessary now to refute the hasty assertions of our countryman Dr. Williams, especially in those worms experimented with by Spallanzani, Bonnet, Morren, and others. No definite remarks, however, have ever been made, so far as the author is aware, with respect to the same power in the Nemerteans.

In a paper on the structure of the British Nemerteans * the author has described the reproduction of the proboscis, the growth of an amputated anterior end (often consisting of little more than a head) into a perfect body and tail, and the remarkable tenacity of life enjoyed by many of the dissevered fragments of the body, which survive for months and elaborate the generative elements in their interior; but since these remarks were made, it has been found that, at least in one species, each of the numerous fragments into which its lengthened and fragile body breaks becomes a perfect animal. Thus has nature gifted these soft worms with a wonderful power of resisting destruction, both as regards the abundance of ova and the vitality of rejected fragments: their very softness and fragility only aid their multiplication.

In retaining specimens of *Borlasia octoculata*, Johnst., in confinement, they have often a great tendency to rupture themselves into many pieces. These fragments lie on the bottom of the vessel, and, in the majority, consist of the body-wall, its nerve-cords and vessels, the central alimentary chamber, and the dorsal sheath for the proboscis. Numerous parasitic gregariniform bodies, as well as the peculiar ova formerly described †, may also be seen in them; and the new animal is thus supplied, *ab initio*, with such structures in its digestive tract without being subjected to the minor stages in their development. For some time after separation the large aperture of the digestive

* Lately communicated to the Royal Society of Edinburgh.

† Journ. of Micros. Science, 1867.

tract existing at each end remains closed by firm contraction of the circular muscular fibres of the body-wall; but by-and-by new cell-growth occurs at both extremities, especially the anterior. At the latter end the parts that are firmly contracted by the primary muscular spasm gradually become more or less consolidated by a cicatrix. This new growth steadily increases in bulk, marking out the anterior end of the fragment, even in its early stages, by its conspicuous pallor. The appearance of the anterior end of a specimen, probably about three weeks after rupture, is shown in fig. 1, Plate VII. The head is represented by the pale sprouting mass in front of the digestive tract, and there is no further differentiation of organs than the separation of the exterior cutaneous elements from the inner mass, and the ciliated aperture (*a*) leading into the chamber of the proboscis. The three contractile circulating channels of the body course forwards to the pale developing region, and apparently communicate with each other without passing into it; they are connected by the usual transverse branches throughout their course. The posterior end of the fragment shoots out into a conical tail (fig. 2, Plate VII.) with a well-formed anus (*z*) in its usual position, and through which a prolapsus of the wall of the digestive tract occasionally occurs under pressure, or an escape of one or more gregariniform parasites.

In the next stage (fig. 3, Plate VII.) the anterior end has assumed a more conical form, and a greater differentiation of organs has occurred. The cutaneous elements are distinctly marked off, and a miniature proboscis (*a'*) occupies its sheath, both springing from a point at some distance behind the tip of the snout, and corresponding to the commissure of the developing ganglia (*h*), which, however, are scarcely apparent. The proboscidian sheath contains a clear fluid and granules, which now and then distend the cavity in front as in the figure. The proboscis (*a'*) is quite free posteriorly. The cephalic fissures are indicated on each side by slight superficial grooves, very strongly ciliated. Besides the faint outlining of the ganglia, which spring from the anterior ends of the nerve-trunks, the cephalic pits and glands (*m*) are likewise indicated. The circulation in the vessels extends only to the posterior border of the white snout. The digestive tract presents no subdivision into regions.

A more advanced condition of the head is found after two or three months (fig. 4, Plate VII.). The snout is very much

elongated both behind and before the commissures. In some there are now eye-specks in the latter region, and there is a distinct channel leading inwards to the enlarged proboscis; the ganglia are approaching the normal shape, and the cephalic pits, with their apertures leading into the posterior end of the cephalic fissures, are well marked. The alimentary tract has assumed a rounded form behind the ganglia, with the mouth (*w*) in the usual position. In those best developed (*e. g.* fig. 5, Plate VII.) the first or œsophageal division of the canal had become differentiated from the succeeding portion; and in the ordinary fragments it was apparent that the former consisted, for the most part, of new texture. Such examples, however, have not always eye-specks. The circulation now scarcely differs from that in the adult.

The motions of the animal, with a reproduced head (fig. 5, Plate VII.), are not so active as those of young Borlasians usually are, and they are at once distinguished by the pointed nature and pallor of their snouts.

The reproduction of a head in *Lineus longissimus* has not yet been observed, though the anterior end of the cicatrix of a fragment is always the larger. It is to be remembered, also, that the conditions under which the animals were kept were most unfavourable; for they were at a great distance from the sea-coast, had no food (except what they might obtain from microscopic animals or fragments of their own bodies), and had a very limited supply of salt-water. Very serious wounds made in removing the proboscis are easily repaired, without leaving a trace of the injury after the pigment is fully developed in the cicatrix.

EXPLANATION OF THE PLATE.

Plate VII.

Fig. 1. Anterior end of a fragment of *Borlasia octoculata* about three weeks after rupture: *a*, terminal aperture; *d*, cutaneous layers. × about 40 diam.

Fig. 2. Posterior end of the same fragment, similarly magnified: *z*, anus.

Fig. 3. Anterior end of a fragment in a more advanced condition: *a'*, developing proboscis; *h*, indication of ganglia.

Fig. 4. Anterior region of a complete, or nearly complete, animal developed from a fragment: *j*, œsophageal division of the alimentary canal; *m*, cephalic pit &c.; *w*, mouth. The other letters as before.

Fig. 5. View of a nearly completed specimen; the regenerated anterior portion, consisting of the head and the œsophageal region of the digestive chamber, is recognized by its pallor: *b*, cephalic fissure. Magnified under a lens.

Observations on the Septum of the Cæcidæ; and some remarks on the subject of the suppression of the Genera *Brochina* and *Strebloceras* or *Phleboceras*.

By the Marquis Léopold de Folin. Communicated by W. Baird, M.D., F.R.S., F.L.S., &c.

(Plate VIII.)

[Read June 18, 1868.]

The importance of the septum, or that part of the shell, in the Cæcidæ, whose function is to close the tube when a portion of it has become useless and been abandoned, has been considered very great. But whilst recognizing the value, as a diagnostic specific character, of the restored apex, I am, nevertheless, of opinion that it should be employed with circumspection in the case of specimens distinguished from each other only by slight differences in this respect. I have observed such imperceptible gradations between two septa apparently most widely distinct, that, it appears to me, but very doubtful reliance can be placed on the character presented by that part of the shell, and that it is always necessary to guard against our being deceived by certain abnormities in form which occasionally affect its value.

It is possible that by paying some attention to the mode in which the obliteration is effected (by which is meant the mode of formation of the septum), we may obtain some aid in support of this opinion, or which may afford the means of explaining it.

It appears evident that the production of an apex to the new shell, as yet incompletely formed, commences by a circular suture on the inner wall of the tube. The plane in which this circumferential suture lies will be termed the "plane of obliteration;" and we may remark at starting that a section which would separate the older from the new shell would lie most frequently in this plane. We will now speak of the desertion of the shell when it has become insufficient for its inhabitant.

It is clear that in attempting to account for the manner in which the mollusk proceeds in the construction of this septum

Fig. 1.

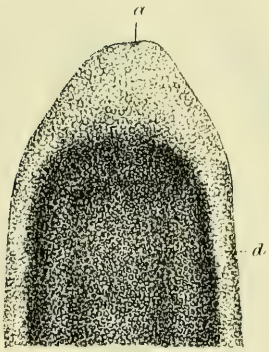

Fig. 2.

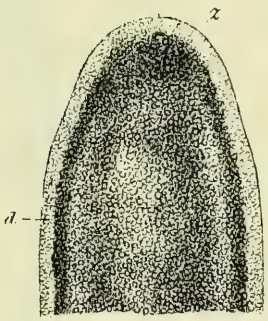

Fig. 5.

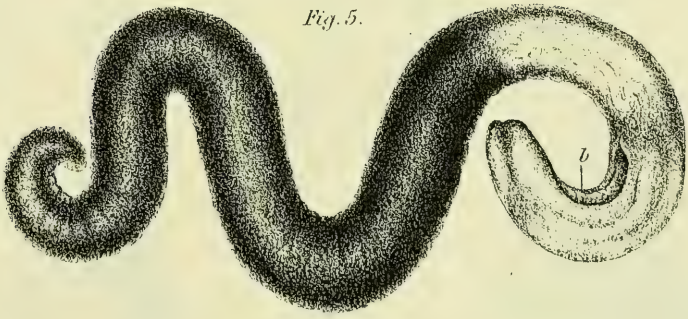

Fig. 3.

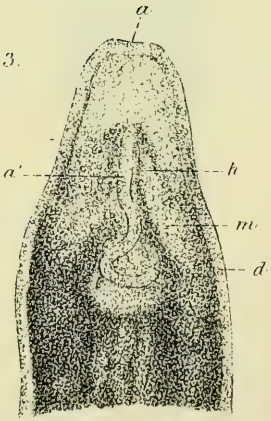

Fig. 4.